

CHAPTER 3.0 TABLE OF CONTENTS

TABLE OF CONTENTS.....	1
3.0 CRITICAL LIFTS	
3.1 SCOPE.....	
3.2 CRITICAL LIFT DETERMINATION	
3.3 CRITICAL LIFT DESIGNATION.....	
3.3.1 Critical Lift Content	
3.4 CRITICAL LIFT EQUIPMENT AND HARDWARE.....	
3.4.1 General	
3.4.2 Rigging for Critical Lifts.....	
3.4.3 Rigging Requirements for Critical Lifts	
3.5 CRITICAL LIFT PLAN	
3.5.1 Critical Lift Plan Approval	
3.5.2 Critical Lift Plan Field Revisions	
3.6 PRELIFT AND FIELD REVISION REVIEW MEETINGS	
3.7 CRITICAL LIFT DOCUMENTATION AND RECORD RETENTION.....	
3.8 SPECIAL LIFTS – NON-CRITICAL LIFTS THAT REQUIRE SPECIAL PRECAUTIONS	
3.9 PRE-ENGINEERED LIFTS	

EXAMPLE ATTACHMENTS

Attachment 3-1 – Forklift Travel Path Sketch.....	11
Attachment 3-2 - Forklift Loading & Lifting Point of Reference Sketch.....	12
Attachment 3-3 – Rigging Sketch.....	13
Attachment 3-4 – Load Path/Crane Capacity Parameters.....	14

CHAPTER 3.0 TABLE OF CONTENTS

TABLE OF CONTENTS.....	1
3.0 CRITICAL LIFTS.....	3
3.1 SCOPE	3
3.2 CRITICAL LIFT DETERMINATION	3
3.3 CRITICAL LIFT DESIGNATION	3
3.3.1 Critical Lift Content.....	4

3.4 CRITICAL LIFT EQUIPMENT AND HARDWARE.....	4
3.4.1 General	4
3.4.2 Rigging for Critical Lifts	4
3.4.3 Rigging Requirements for Critical Lifts.....	5
3.5 CRITICAL LIFT PLAN	6
3.5.1 Critical Lift Plan Approval	8
3.5.2 Critical Lift Plan Field Revisions	8
3.6 PRELIFT AND FIELD REVISION REVIEW MEETINGS	8
3.7 CRITICAL LIFT DOCUMENTATION AND RECORD RETENTION	8
3.8 SPECIAL LIFTS – NON-CRITICAL LIFTS THAT REQUIRE SPECIAL PRECAUTIONS	9
3.9 PRE-ENGINEERED LIFTS	9

EXAMPLE ATTACHMENTS

Attachment 3-1 – Forklift Travel Path Sketch.....	11
Attachment 3-2 - Forklift Loading & Lifting Point of Reference Sketch.....	12
Attachment 3-3 – Rigging Sketch.....	13
Attachment 3-4 – Load Path/Crane Capacity Parameters.....	14

This Page Intentionally Blank

3.0 CRITICAL LIFTS

3.1 SCOPE

This chapter includes guidelines, rules, and requirements applicable to critical lifts and describes the planning and documentation required to perform a critical lift. This chapter also summarizes ordinary (non-critical) lifts for which special precautions are required.

3.2 CRITICAL LIFT DETERMINATION

The manager who has responsibility for the item to be lifted has the authority to require that it be handled as a critical lift. In addition, the manager at the facility where the lift will be performed also has the authority to require that it be handled as a critical lift. The manager who designates a lift as a critical lift shall ensure that a designated leader (DL) be assigned.

3.3 CRITICAL LIFT DESIGNATION

Critical lift designation implements administrative and physical controls to minimize the possibility of equipment failure or human error to a hoisting or forklift operation involving a load, that if mishandled, poses unacceptable consequences. A lift shall be designated as a critical lift when any of the following criteria is met, unless otherwise specifically defined in safety basis:

1. If loss of control of the item being lifted would likely result in declaration of a "Site Area Emergency" or "General Emergency" as defined in the facility emergency plan or construction site emergency plan.

NOTE: DOE-O223 *Emergency Plan Implementing Procedure* requires DOE Facilities to have emergency plans based on potential accident scenarios resulting in radiological or chemical releases. Each facility shall determine the potential release Quantities in the event of the loss of control. Designate the lift as Critical if the potential release could result in a "Site" or "General" emergency. For construction sites apply requirements in 29 CFR 1910 and or 1926.

2. The item being lifted is unique and, if damaged, would be irreplaceable or not repairable and is vital to a system, facility, or project operation.
3. The cost to replace or repair the item being lifted, or the delay in operations of having the item damaged would have a negative impact on facility, organizational, or DOE budget to the extent that it would affect program commitments.
4. The item, although non-critical, is to be lifted above or in close proximity to a critical item or component.
5. The load being lifted is 80 % or more of a mobile crane's gross load chart rating. (Example 100 ton crane lifting 80 tons or more)
6. Two mobile cranes are lifting the load and the load share equals more than 70% of one or both crane's chart rating for the maximum radius that will be experienced.

3.3.1 Critical Lift Content

A Critical lift designation provides:

- Documented step-by-step instructions (see 3.5)
- Sign-off approvals for technical, management, safety, and engineering.
- Independent pre-identification of load weight, load center of gravity, lift attachment points, and lifting hardware minimum capacities (slings, below-the-hook lifting devices, shackles, etc.) that will be used for the lift or series of lifts.
- Independent pre-identification of crane (s) or fork lift (s) with minimum capacities identified for configuration to be used.
- Evaluation of hazards associated with the lift that may include but is not limited to environmental, ground support, power lines, and physical obstructions.
- Pre-identified special limiting or stop-work conditions.

3.4 CRITICAL LIFT EQUIPMENT AND HARDWARE

3.4.1 General

Before making a critical lift, the DL shall ensure that equipment (cranes, hoists, forklift trucks, rigging etc.) periodic inspections are current, a pre-use inspection has been performed and that rated-capacity/proof/load tests have been performed for slings, rigging, rigging hardware, and below-the-hook devices. (Exceptions apply to manufacturer-installed rigging hardware. See paragraph 3.4.1.1.) The DL has confirmed through communications with management or reviewed documents ensuring personnel performing the lift are currently qualified for their assigned tasks.

3.4.1.1 Manufacturer-Installed Rigging Hardware on Engineered Equipment

Engineered equipment with manufacturer-installed rigging hardware (eyebolts, swivel hoist rings, etc.) should be purchased with load-test documentation supplied. Rigging hardware on engineered equipment, installed by the equipment manufacturer, without test documentation, may be used if approved by a rigging specialist or qualified engineer and inspected by a qualified inspector before use.

3.4.2 Rigging for Critical Lifts

The rigging components (slings, rigging hardware, below the hook lifting devices) to be used in critical lifts shall be rated-capacity/proof/load tested as specified in applicable ASME Standards. Rigging components that have been tested shall be marked or tagged by the user, a third party, or the manufacturer to verify the rated-capacity/ proof/ load test (see examples in applicable chapters for the specific equipment). Documentation shall be traceable to rigging component. Traceability may be accomplished by placing a tag or other permanent marking on the hardware. The manufacturer, the user, or a third party may perform load/proof tests. Tags or other permanent marking fulfill documentation requirements without paperwork. Below-the-hook lifting devices require rated load test documentation be kept in the devices history/maintenance file (see chapter 11).

3.4.3 Rigging Requirements for Critical Lifts

Each rigging component is qualified in accordance with Section 3.4.2. Rigging for critical lifts can include the following and shall meet the requirements found in the referenced chapter that includes testing and marking requirements.

1. **Wire Rope Slings**, See Chapter 9 “Slings,” ASME B30.9 for wire rope sling requirements.
2. **Alloy Chain Slings**, See Chapter 9 “Slings,” ASME B30.9 for alloy chain slings requirements.
3. **Metal Mesh Slings**. See Chapter 9 “Slings,” ASME B30.9 for metal mesh slings requirements.
4. **Synthetic Web Slings**. See Chapter 9 “Slings,” ASME B30.9 for synthetic web slings requirements.
5. **Synthetic Rope Slings**. See Chapter 9 “Slings,” ASME B30.9 for synthetic rope slings requirements.
6. **Synthetic Round slings** See Chapter 9 “Slings,” ASME B30.9 for synthetic rope slings requirements.
7. **Rigging Blocks**. See Chapter 10 “Rigging Hardware,” ASME B30.26 for rings rated load test requirements.
8. **Shackles**. See Chapter 10 “Rigging Hardware,” ASME B30.26 for shackles requirements.
9. **Eyebolts**. See Chapter 10 “Rigging Hardware,” for eyebolts requirements.
10. **Rings, links and swivels**. See Chapter 10 “Rigging Hardware,” ASME B30.26 for rings requirements.
11. **Swivel Hoist Rings**. See Chapter 10 “Rigging Hardware,” ASME B30.26 for swivel hoist rings requirements.
12. **Turnbuckles**. See Chapter 10 “Rigging Hardware,” ASME B30.26 for turnbuckles requirements.
13. **Below-the-Hook Lifting Devices**. See Chapter 11 “Below the Hook Lifting Devices” ASME B30.20 & BTH-1 for requirements and for requirements imposed by ANSI N14.6 when applied.
14. **Dynamometers and Precision Load-Position Devices (hydro-set)**. Load test at maximum capacity.

NOTE: The tolerance for load tests/proof tests is +0, -5%. If the hardware manufacturer recommends loads greater than those listed in the referenced ASME standard, the manufacturer’s recommendations should be followed.

3.5 CRITICAL LIFT PLAN

A step-by-step plan or work instructions shall be prepared and approved by technical approver, qualified rigging engineer, qualified occupational safety representative and manager (see 3.5.1). Critical lift plans shall be a stand-alone document with all required information and approvals. The DL shall have the critical lift plan at the work location during the lift(s).

Critical lift plans shall contain documented step-by-step instructions and drawings containing: (see example drawings - attachments 1-4)

- 1 Identity of the item(s) to be lifted.
- 2 Special precautions, if any (such as mats for mobile cranes).
- 3 Weight of the item and total weight of the load (For mobile cranes, see the manufacturer's instructions regarding components and attachments that must be considered as part of the load).
- 4 A list that specifies each specific piece of equipment (e.g., crane, hoist, fork truck), accessory, and rigging component (e.g., slings, shackles, spreader bars, yokes) to be used for the lift. (This list shall identify each piece of equipment by type, size and rated capacity.) When a lift plan identifies multiple cranes, forklifts or rigging components that may be used for the lift(s), the plan shall require verification of the specific ones used for the lift(s).
- 5 Identification of pre-identified hazards associated with the lift that may include but is not limited to environmental, ground support, and physical obstructions, power lines etc.
- 6 Designated checkpoints or hold points and estimated instrument readings, as relevant, so that job progress can be checked against the plan.
- 7 Hold points or sign-off points shall be provided for personnel assigned to witness the work. Sign-offs, (initial and /date) in the plan as key steps are completed or validated.
- 8 Rigging sketch(s), which include the following: (see example attachments 1-4)
 - a) Dimensions of item to be lifted including center of gravity
 - b) Lift point identification.
 - c) Method(s) of attachment and hitch configuration for slings.
 - d) Capacity and tension on slings, rigging hardware and lifting devices at the configuration shown.
 - e) Sling angles.

- f) Accessories used (softeners, dunnage etc).
 - g) Other factors affecting the equipment capacity such as but not limited to D/d ratio or temperature when applicable.
 - h) Rated capacity of the cranes or forklifts in the configuration(s) in which it will be used. For mobile cranes, many factors affect rated capacity, including boom length, boom angle, and work area (radius). Forklift attachment (s) that effect capacity must be identified.
 - i) A Pre-identified load-path sketch that shows the load path and height when applicable. (For lifts with mobile cranes, include the crane position(s) relative to the load and relative to surrounding obstructions. Where appropriate, include floor or soil-loading diagrams.
 - j) A note(s) indicating lifting, travel speed and height limitations when applicable. This may be noted on the load-path sketch or on a separate sketch.
- 9 Approvals for technical, management, safety, and engineering. (see Chapter 2.2.9 Responsibilities, Approvers of Hoisting and Rigging Lift Plans)
 - 10 A list of required personnel assignments and or responsibilities.
 - 11 Verification of personnel qualifications (this may be accomplished via communications with management or reviewing documents).
 - 12 A sign-off to document verification that equipment (cranes and forklifts), rigging, hardware and below the hook lifting device inspections, periodic and pre-use, are current and has been subjected testing as required in applicable chapter.
 - 13 Verification that installed lifting or attachment points have been inspected
 - 14 Pre-identified stop work conditions such as, but not limited to, weather or other conditions that would require termination of the lift.
 - 15 Requirement to perform operational test of functions of the crane through the full range of movements that will be used to perform the lift (s). The test shall be performed with the crane set up in the exact configuration as will be used to perform the lift or series of lifts with no load on the hook.
 - 16 Documentation of lift and pre-job meeting.
 - 17 Copies of any completed Electrical Utilities Electrical Site Visit form (s) or ground scans when applicable to the lifting activity for mobile cranes and forklifts.

NOTE: Although individual plans are prepared for one-time critical lifts, more general (multi-use) plans may be employed to accomplish recurrent critical lifts. For example, a general plan may be used to lift an item or series of similar items that are handled repeatedly in the same manner. Several or multiple lifts of various loads may be contained in one critical lift plan.

3.5.1 Critical Lift Plan Approval

The critical lift plan or work instructions should be approved as required by the responsible contractor's processes and, as a minimum, shall be signed and dated by the following:

1. Technical approver (see Appendix A for definition)
2. Manager responsible for the item to be lifted
3. Qualified rigging engineer
4. Qualified safety representative.

Note: See Chapter 2.2.9 Approvers of Hoisting & Rigging Lift Plans

3.5.2 Critical Lift Plan Field Revisions

Critical lift plan or work instruction field revisions shall be accomplished by drawing a single line through the original (deleted) text and inserting the field revision close to the deleted text. The field revision shall be initialed and dated by the person(s) making the revision. Text shall not be obliterated by the use of correction fluid, correction tape, scribbling, erasure, or any other method. Field revisions should be approved as required by the responsible contractor's plans. As a minimum, critical lift field revisions shall be signed and dated in the margin of each revised page by all of the following:

1. The manager of the lifting operation or facility manager
2. The DL
3. The qualified rigging engineer
4. Qualified safety representative

NOTE: Critical lift field revisions may be confirmed by telephone and must be signed and dated within two working days of the field revision.

3.6 PRELIFT AND FIELD REVISION REVIEW MEETINGS

Before performing a critical lift and immediately following a field revision, participating personnel shall meet to accomplish the following.

1. Review the critical lift plan or field revision
2. Discuss any hazards, controls, hold points, coordination with other work groups, unique conditions, and emergency contingencies
3. Resolve questions before beginning work.

3.7 CRITICAL LIFT DOCUMENTATION AND RECORD RETENTION

As a minimum, documentation of each prelift and field revision meeting shall include an attendance roster showing the meeting time and date and a list of attendees. The DL or facility-assigned person shall retain meeting documentation until the lift is satisfactorily completed. When the job is finished, the DL or facility-assigned person shall transmit the critical lift documentation to the manager for whom the lift was done. This documentation is subject to audit for 1 year after the lift is completed.

Documentation of a critical lift shall include the following:

1. The critical lift plan, recording job completion with approval signatures and hold point sign-offs as applicable.

2. Documentation of the pre-lift meeting; containing, as a minimum, the meeting date and list of attendees.
3. Any additional documentation deemed appropriate by management.

NOTE: Documentation of the pre-lift meeting shall be included as part of the critical lift plan.

3.8 SPECIAL LIFTS – NON-CRITICAL LIFTS THAT REQUIRE SPECIAL PRECAUTIONS

This special lift section identifies elements of chapters in the manual that contain additional requirements when performing specific hoisting and rigging activities and allows elements of the critical lift requirements to be adopted at management's discretion to provide additional administrative and physical controls. As addressed in other parts of this manual, certain lifting operations require special precautions. Special precautions are required under the following conditions:

1. A mobile crane is working near power lines or transmission towers (see Chapter 14).
2. A forklift is working near power lines or transmission towers (see Chapter 6).
3. Personnel are being lifted with cranes or forklifts. For mobile cranes, follow the requirements found in Chapter 15. For forklift trucks, follow the requirements found in Chapter 6.
4. Two or more cranes will be used to make a lift. (For hoists, jib cranes, and monorail systems, follow requirements found in Chapter 12. For overhead and gantry cranes, follow the requirements found in Chapter 13. For mobile cranes, follow the requirements found in Chapter 14.
5. Mobile crane pick and carry operations, follow requirements found in chapter 14.

3.9 PRE-ENGINEERED LIFTS

Provides, at management discretion, independent pre-identification of load weight, load center of gravity, lift attachment points, and minimum lifting hardware capacities (slings, below-the-hook lifting devices, etc.) that will be used for the lift or series of lifts for noncritical items such as but not limited to the following:

- Large or unusually configured loads outside a fork truck's load center will be handled. Follow the requirements found in Chapter 6, paragraph. 6.12, item d.
- Loads close to an existing building or operating equipment that if dropped or upset would cause damage to building or equipment.
- Non-routine rigging configurations are being used or items require special care because of size, weight, close-tolerance installation, or high susceptibility to damage.

Forklift Travel Path Sketch

EXAMPLE

Sketch #1- Box XXXX

Location of box: 218-W-4C, Trench 7

Destination: Relocate Waste Box to Provide Access for Loading
on to IP-1 Shipping Container

Box dimensions: 16'-0" long 9'-0" wide x 10' 8" high

Box weight: 10,900 lbs

Estimated box center of gravity is at geometric center of box

Forklift: Taylor Model TE520-M (HO-75-4713) Equipped with

Forklift Lifting Device FKLD- YYYY-001 (One on each Fork)

capacity 14,000lbs each, weight 400 lbs each

Technical approver

Date

Manager Responsible for item to be lifted

Date

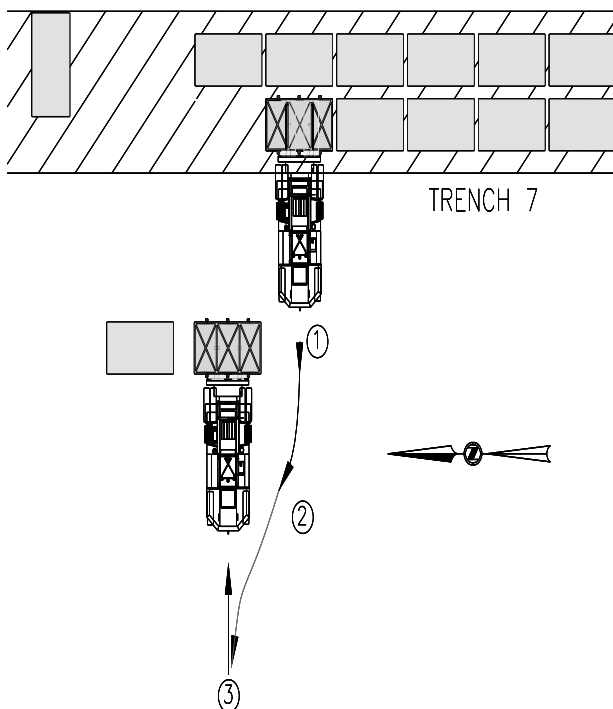
Qualified rigging engineer or assigned

Date

Qualified Occupational safety representative

Date

1. Pick up box in Trench 7 and back north approximately 10 feet.
2. Back North East approximately 15 feet.
3. Move forward to align box as directed by PIC. Leave at least 5 feet between waste boxes



ATTACHMENT 3 - 2

Forklift Loading & Lifting Point of Reference Sketch

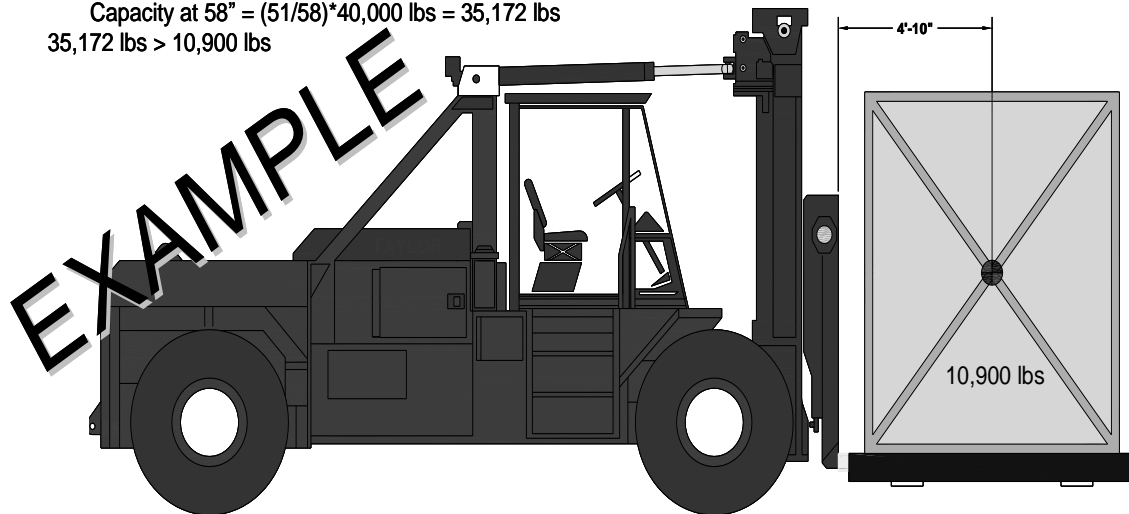
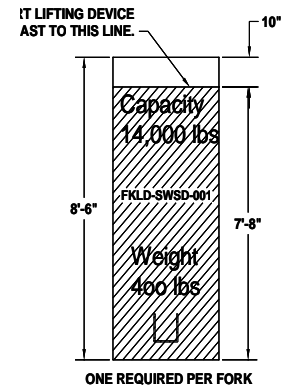
Sketch #2- Box XXXX

Location of box: 218-W-4C, Trench 7
 Destination: Relocate Waste Box to Provide Access for Loading
 on to IP-1 Shipping Container
 Box dimensions: 16' 0" long 9' - 0" wide x 10' - 8" high
 Box weight: 10,900 lbs
 FKLD-YYYY-001 fork attachments 2, capacity 14,000lbs each,
 weight 400 lbs each

Estimated box center of gravity is at geometric center of box
 Forklift: Taylor Model TE 520M Y 350D (HO-75-4173)
 Forklift Capacity with FKLD-YYYY-001 installed 40,000 @ 51
 inches from face of fork.

Capacity at load center of 58 inches

Capacity at 58" = $(51/58) * 40,000 \text{ lbs} = 35,172 \text{ lbs}$
 $35,172 \text{ lbs} > 10,900 \text{ lbs}$

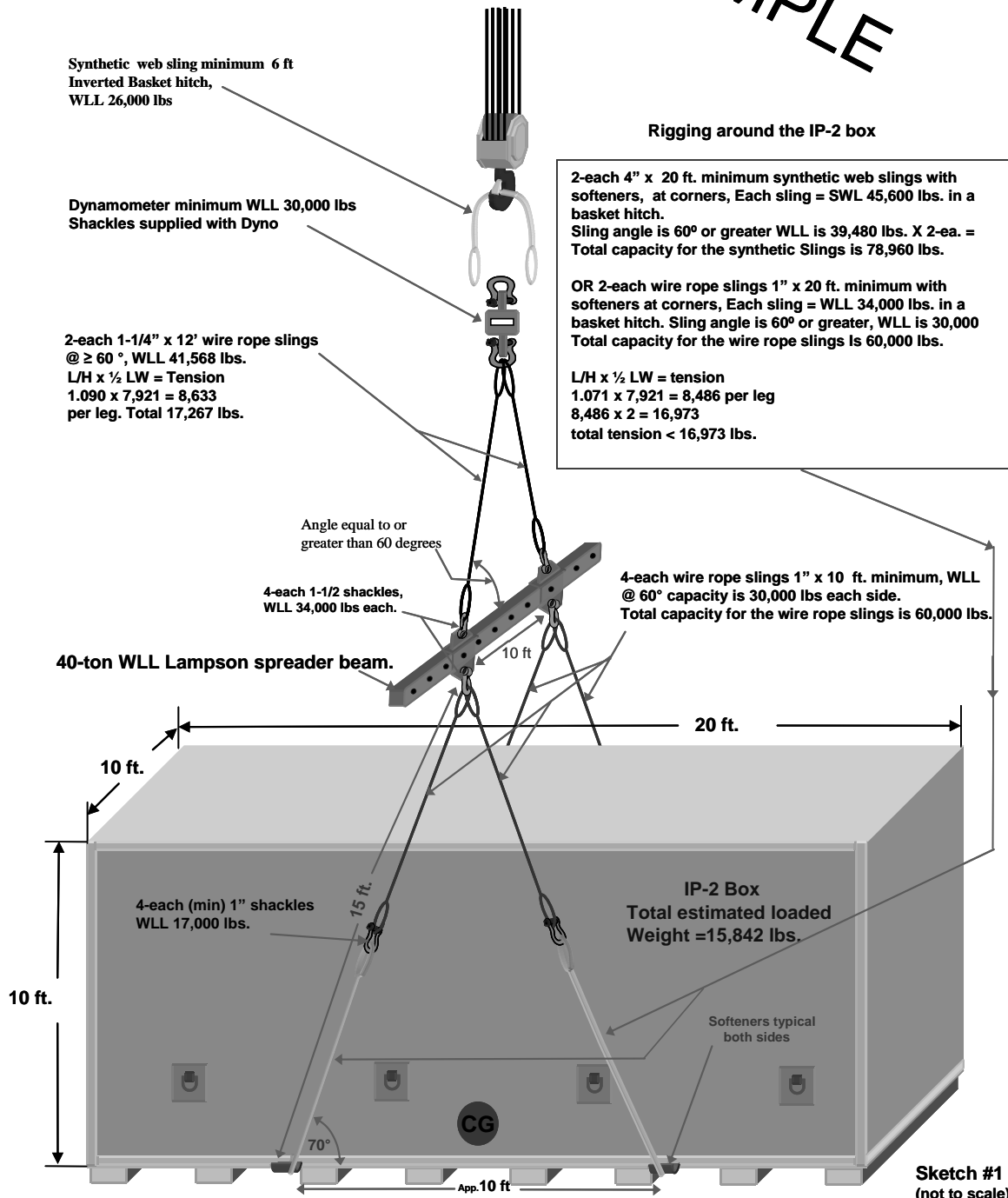


ATTACHMENT 3 – 3

Rigging Sketch

Exact orientation and equipment location of the crane, load and IP-2 box container shall be determined by the DL and the FWS. Always refer to the Mobile crane load capacity chart for allowable crane and rigging hardware load deductions and the cranes lifting capacity parameters. Do not exceed the crane capacity load chart.

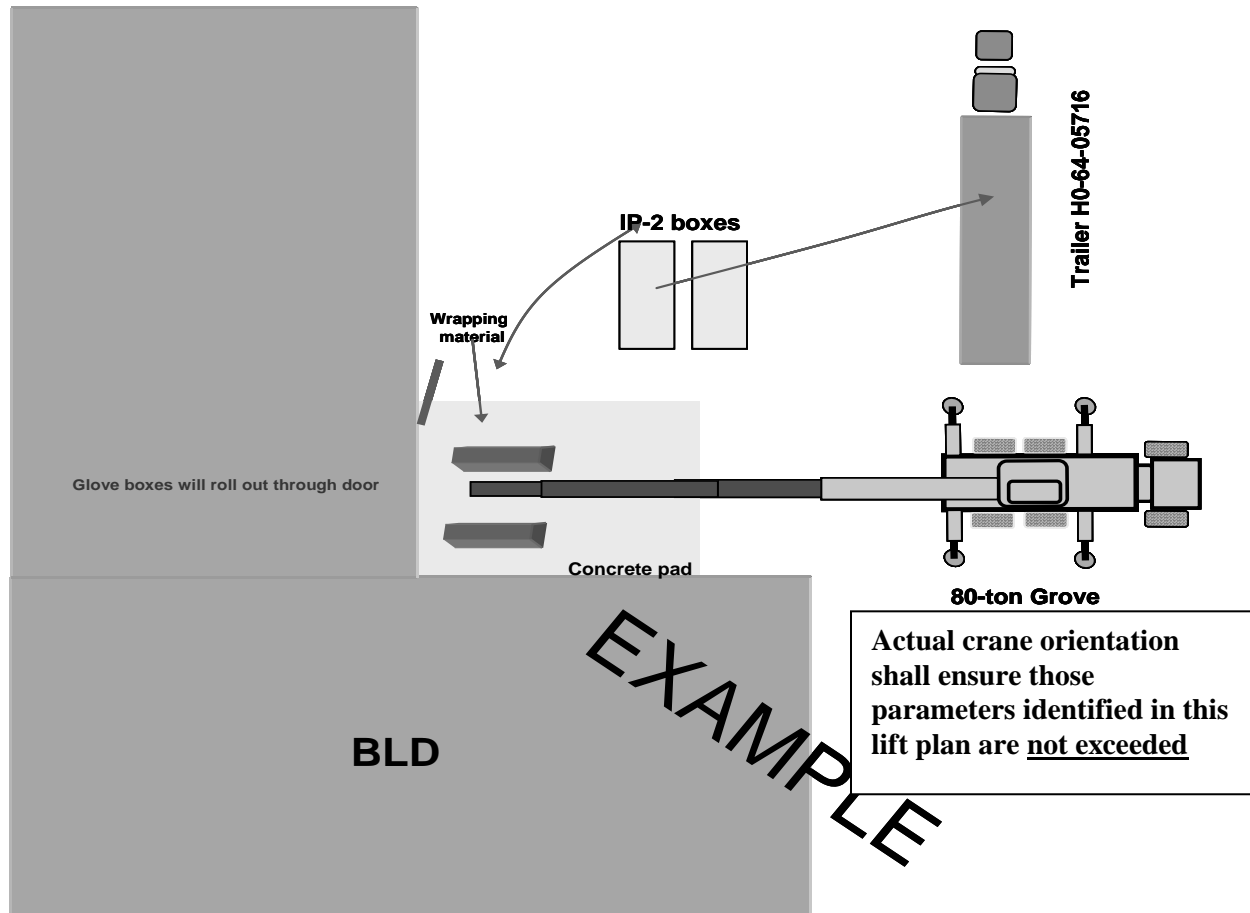
EXAMPLE



ATTACHMENT 3 – 4

Load Path / Crane Capacity Parameters

Exact orientation and equipment location shall be determined by the DL and FWS.
 The crane can be repositioned for the lifting the glove boxes or the loaded IP-2 boxes.
 The glove boxes will be rolled outside and lifted (1st lift) and set onto wrapping material.
 Once wrapped and secured, lifted (2nd lift) again and placed into the designated IP-2 box.
 Once the IP-2 box cribbing and lid is secured each IP-2 box (3rd lift) will be loaded, one per shipment on to trailer HO-64-05716 and secured for shipment.

**IP-2 Lifts**

80-Ton Grove mobile crane, 360°,
 @ 45 ft. radius, 96 ft. maximum
 Boom (61°) boom angle,
 Crane capacity is 25,450 lbs.

Loaded IP-2 box	15,842 lbs.
Hook Block	1,965 lbs.
Ball	750 lbs.
Jib stowed	926 lbs.
Aux. boom head	230 lbs.
Spreader bar	775 lbs.
Dynamometer	300 lbs.
Shackles	90 lbs.
Rigging slings	200 lbs.
Total weight	21,078 lbs.

Glove Box Lifts

80-Ton Grove mobile crane, 360°,
 @ 70 ft. radius, 87 ft. (32°) (min) boom,
 114 ft. (51°) (Max) boom,
 Crane capacity is 10,150 lbs.

Each glove box	4,500 lbs.
Hook Block	1,965 lbs.
Ball	750 lbs.
Jib stowed	926 lbs.
Aux. boom head	230 lbs.
Spreader bar	775 lbs.
Shackles	90 lbs.
Dynamometer	300 lbs.
Rigging slings	200 lbs.
Total weight	9,736 lbs.

Sketch #3
 (not to scale)

This Page Intentionally Blank